

REMARKS

Claims 1-8 are pending and stand rejected.

Claim Rejections

Claims 1-8 are rejected pursuant to 35 U.S.C. §103(a) as being obvious over JP 01-215290 of Kimura et al. ("Kimura") in view of DE 3938779 of Bosch, U.S. Patent No. 4,581,939 of Takahashi, and U.S. Patent No. 6,252,195 of Mosavi et al. ("Mosavi"). The Examiner argues that Kimura discloses an apparatus and method for the laser cutting of cells, but admits that Kimura does not teach the type of laser, the formation of a hole, and the use of a spherical lens or the formation of a surgical needle. The Examiner submits that Bosch discloses the laser drilling of small holes in a metal part, and Takahashi discloses a spherical lens. The Examiner argues that

[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to use a vibrating workpiece as taught by Kimura et al. and Bosch because this deals with small systems which are prone to vibration and debris removal problems. In addition, the spherical lens as taught by Takahashi is merely a specific type of lens used in laser system [stet] and hence is a design choice and variation (design variation and rearrangement of parts is known in the art).

The Examiner further argues that Mosavi discloses forming holes in a surgical needle using an Nd-Yag laser, and that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to make surgical needles, as taught by Mosavi et al., in the Kimura et al. and Bosch system because the vibrational system ensures a high quality bore hole."

While the Examiner's rejection is unclear, as the Examiner has failed to point to specific teachings in each reference for each and every element of the claim and has further failed to provide a detailed explanation with findings of fact as to how a person skilled in the art would have relied on those teachings to arrive at the claimed invention, all of the references are deficient, taken alone or combined.

At the outset, Kimura is non-analogous art and would not be relied on to arrive at the claimed invention. Kimura is directed to a method for irradiating cells, and is not within the field of drilling

apparatus, nor does it relate to the particular problem to be solved – namely, to accurately produce an opening in a workpiece. Accordingly, Kimura cannot be relied on as prior art. Regardless, Kimura fails to teach or even suggest numerous limitations set forth in claims 1 and 6. First, Kimura does not teach a workpiece that is engaged by or mounted to a first vibrating frame, as required by claims 1 and 6. Kimura merely states that a cell sample is located on a stage which is *allowed* to move. This statement is not a teaching that the frame containing the sample vibrates. Kimura also fails to teach or even suggest a laser mounted on a second frame that does not vibrate, as further required by claims 1 and 6. The figures in Kimura illustrate the laser and the lens mounted on the same frame, and Kimura states that the lens vibrates. Since the lens vibrates, the stage that the lens is mounted on, as well as the laser attached thereto, must also vibrate. Kimura further fails to teach a lens that is mounted on the first vibrating frame (i.e., the frame containing the workpiece), as further required by claims 1 and 6. To the contrary, the images show the lens separated from the stage containing the sample. Kimura therefore fails to teach any of the limitations of independent claims 1 and 6. None of the remaining references remedy the deficiencies of Kimura.

Bosch merely teaches a laser apparatus for drilling holes in a work piece, and does not remedy any of the deficiencies of Kimura. The workpiece is oscillated as a stationary beam is transmitted through a stationary lens to rapidly forms holes in the workpiece. The lens is not attached to the workpiece and does not oscillate with the workpiece, as required by claims 1 and 6. The Examiner appears to be relying on Bosch to teach drilling holes, however none of the claims recite drilling holes. Thus, Bosch is not relevant prior art. Bosch also would not be combined with Kimura because, as explained above, Kimura is directed to a method for irradiating cells and is non-analogous art. Moreover, no person having ordinary skill in the art would combine a reference directed to irradiating cells with a reference directed to drilling holes.

Takahashi likewise fails to remedy the deficiencies of Kimura. The only teaching of Takahashi that is set forth in the claimed invention is a spherical lens, however Takahashi does not provide any teachings relating to the spherical lens that would motivate a person having ordinary skill in the art to use such a lens with Kimura, or any of the other references cited by the Examiner. Takahashi merely states that a spherical lens is used, and does not provide any advantages to using such a lens. Moreover, Takahashi is directed to an apparatus for detecting flaws in a surface, and

does not relate in any way to a drilling apparatus. None of the components of Takahashi even vibrate. Takahashi states that vibration generated in the surface of the material due to ultrasonic beams reflected by a defect in the material will indicate a defect in the material. Only the reflected ultrasonic beam is vibrating – the light, lens, and material all remain stationary and are not vibrated in any way. Accordingly, this reference is not relevant prior art, and no person having ordinary skill in the art would even rely on this to modify Kimura or any other reference relating to a drilling apparatus. In fact, like Kimura, Takahashi is non-analogous prior art that cannot be relied on, as Takahashi is not within the field of drilling apparatus, and Takahashi is not pertinent to the problem of forming accurate holes in a workpiece.

Mosavi is also deficient and does not remedy any of the deficiencies of Kimura. Mosavi is merely relied on to teach features recited in dependent claims 3 and 8, and fails to teach a lens mounted on a vibrating substrate. Mosavi also would not be relied on to modify the teachings of Kimura because, as explained above, Kimura is non-analogous art.


In conclusion, none of the cited references teach or even suggest a method that includes both a workpiece and a lens mounted on a first vibrating frame, and a laser mounted on a second frame that does not vibrate. Independent claims 1 and 6, as well as claims 2-5 and 7-8 which depend therefrom, therefore distinguish over the prior art represent allowable subject matter.

Conclusion

In view of the above remarks, Applicant submits that all pending claims are in condition for allowance, and allowance thereof is respectfully requested.

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Respectfully submitted,



Lisa Adams, Reg. No. 44,238
Attorney for Applicant

NUTTER, McCLENNEN & FISH, LLP
World Trade Center West
155 Seaport Boulevard
Boston, MA 02110
Tel: (617) 439-2550
Fax: (617) 310-9550

PENDING CLAIMS

1. (Previously Presented) A method of laser drilling a vibrating workpiece, comprising:
providing a workpiece engaged by a first vibrating frame of a vibrating machine, wherein the workpiece is vibrating substantially in unison with the first vibrating frame;
providing a laser apparatus mounted to a second frame, wherein the second frame is substantially isolated from the vibrating frame and does not vibrate;
providing a spherical focusing lens that is mounted to the first vibrating frame, wherein the spherical focusing lens is vibrating substantially in unison with the first vibrating frame;
aligning the laser apparatus and the spherical focusing lens such that a laser beam emitted by the laser apparatus is directed through the vibrating spherical focusing lens to a target location on the vibrating workpiece; and
causing the laser apparatus to emit a beam through the spherical focusing lens, wherein the beam is stationary with respect to the vibrating spherical focusing lens, and wherein the beam strikes the vibrating workpiece at the target location.
2. (Original) The method of claim 1, wherein the laser comprises an Nd-Yag laser.
3. (Original) The method of claim 1, wherein the workpiece comprises a surgical needle.
4. (Original) The method of claim 1, wherein the laser beam is pulsed.
5. (Previously Presented) The method of claim 1, wherein the workpiece is mounted to a fixture which is mounted to the first vibrating frame, wherein the fixture vibrates substantially in unison with the first vibrating frame.
6. (Previously Presented) An apparatus for laser drilling a vibrating workpiece, comprising:
a workpiece mounted to a first vibrating frame;
a laser apparatus mounted to a second frame, wherein the second frame is substantially isolated from the first vibrating frame and is substantially non-vibrating; and,
a spherical focusing lens mounted to the first vibrating frame for directing a laser beam emitted by the laser apparatus to a target site on the workpiece, such that the spherical focusing lens

vibrates substantially in unison with the first vibrating frame, while the laser beam is substantially stationary with respect to the vibrating spherical focusing lens.

7. (Original) The apparatus of claim 6, wherein the laser comprises an Nd-Yag laser.
8. (Original) The apparatus of claim 6 wherein the workpiece comprises a surgical needle.

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